

COURSECONTENT

ADVANCED REINFORCED CONCRETE DESIGN								
I Semester: SE								
Course Code	Category	Hours/ Week			Credits	Maximum Marks		
2512044	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes:45		Tutorial Classes:Nil		Practical Classes:Nil		TotalClasses:45		
Prerequisites: NIL.								

Course Overview:

The course on Limit State Analysis of R.C. Structures provides a comprehensive understanding of the design and behavior of reinforced concrete members under various loading conditions. It introduces fundamental concepts such as different types of loads, load combinations, and modern design approaches like the Limit State Method. The course covers the analysis and design of structural elements including beams, slabs, and columns, considering flexure, shear, bond, torsion, and compression. Advanced topics like yield line theory for slabs, moment redistribution, and plastic hinge formation are also included. It emphasizes IS code provisions, safety factors, and reinforcement detailing for safe and economical design. Overall, the course develops the ability to design durable and reliable reinforced concrete structures in practical engineering applications.

Course Objectives:

1. To understand limit state concepts, load combinations, material factors, and moment redistribution in RC structures.
2. To apply IS code provisions to analyze and design RC beams in flexure under various loading conditions.
3. To analyze and design slabs using yield line theory and limit state concepts for different slab systems and support conditions.
4. To design RC members for shear, bond, and torsion using limit state principles and proper reinforcement detailing.
5. To design short and slender RC columns considering stability, slenderness effects, and additional moment provisions.

Course Outcomes: After Completion of the Course, Students should be able to

1. Describe the various loads, load combinations, design methods, and key concepts such as plastic hinges and moment redistribution in limit state design.
2. Illustrate IS code provisions by working out bending moment envelopes for fixed, continuous, deep beams, and corbels.
3. Investigate slab behavior using yield line and equilibrium methods, and determine reinforcement requirements for ribbed and flat slabs.
4. Critique design approaches for shear, bond, and torsion failures and recommend effective reinforcement detailing according to limit state principles.
5. Design short and slender columns including applying the additional moment method and slenderness criteria.



MARRI LAXMAN REDDY

INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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SYLLABUS:

UNIT -I

Limit State Analysis of R.C. Structures: Introduction – Loads – Different types of Loads and load combinations – Different methods of Design – Working Stress Method and Limit State Method – Materials – Characteristic Values – Reliability based methods of design – Partial safety factors – Stress Block Parameters – Plastic hinge, Redistribution of moments, moment rotation characteristics of RC member

UNIT -II

Limit State of Flexure: I.S. code provisions, loading pattern, Bending Moment Envelope, Application for Fixed Beams and Continuous Beams, Deep Beams and Corbels

UNIT -III

Inelastic Analysis of Slabs: Yield line criterion – Virtual work and equilibrium methods of analysis – For square, circular, rectangular, triangular and hexagonal slabs with simple and continuous end conditions – Reinforcement details – Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, deflection, arrangement of reinforcements – Flat slabs: Direct design method – Distribution of moments in column strips and middle strip – moment and shear transfer from slabs to columns – Shear in Flat slabs – Check for one way and two way shear – Introduction to Equivalent frame method – Limitations of Direct design method – Distribution of moments in column strips and middle strips, sketch showing reinforcement details

UNIT -IV

Limit State of Shear, Bond and Torsion: Design for Shear, Bond and Torsion – Mechanism of shear and bond failure – Design of shear using limit state concept – Design for Bond – Anchorage and Development length of bars – Design of sections for torsion – Detailing of reinforcement

UNIT- V

Limit State of Compression: Design of Short and Long columns – slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Procedure for Design of Slender Columns

REFERENCE BOOKS:

1. “Reinforced Concrete Design” S. Unnikrishna Pillai & Devdas Menon; Tata Mc. Graw Hill Publishing Company Ltd. New Delhi 2010.
2. “Advanced Reinforced Concrete” P. C. Varghese Prentice Hall of India Private Ltd. 2008.
3. “Design of Reinforced Concrete Structures” by N. Subramanian, Oxford University Press.
4. “Limit State Theory and Design of Reinforced Concrete” Dr. S. R. Karve and V. L. Shah. Standard Publishers, Pune 2004.
5. Design of Concrete Structures – Arthur H. Nelson, David Darwin, and Charles W. Dolan, Tata Mc. Graw Hill, 3rd Edition, 2005.
6. Reinforced Concrete Design by Kenneth Leet, Tata Mc. Graw Hill International Editions, 2nd Edition, 1991.
7. “Design Reinforced Concrete Foundations” P. C. Varghese Prentice Hall of India Private Ltd.
8. IS 456:2000 Plain and Reinforced Concrete Code of Practice.



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9. SP 16 – Design Aids for Reinforced Concrete to IS 456
10. SP 34 – Handbook on Concrete Reinforcement and Retaining

ELECTRONIC RESOURCE:

<https://nptel.ac.in/courses/105106224>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Definitions and terminology
4. Assignments
5. Model question paper–I
6. Model question paper–II
7. Lecture notes
8. E-Learning Readiness Videos(ELRV)